*Skrivet av Evan Saboo & Perttu Jääskeläinen*

Artificial neural network (ANN) is algorithms that find relationships in a dataset similar to how humans think. ANN are based on the same principle as a human brain, as people learn through their surroundings and then save the information. In order for an artificial neural network to find relationships, it must first be trained. They learn by training them with examples where the correct result is known. The deviation from the correct result is used to adjust the settings, and then try again until the result is correct. ANN can sometimes solve problems that can not be managed by any known algorithm, such as finding patterns and recognizing patterns. For example, they can be trained to interpret handwritten text or to recognize faces. ANN is also good at other areas, for example stock market prediction and image compression.[[1]](#footnote-0) [Lecture 7]

ANN are limited by the hardware it uses and the time takes to train it. If the ANN needs to compute more complex tasks, it requires a considerable amount of compute power and the longer time to produce good results.

A ANN consists of an interconnected group of nodes, similar to the vast network of neurons in a brain. Each node represents a neuron. Neurons are arranged in layers where neurons in one layer are connected to neurons in another layer. A typical ANN multilayer consists of differents layers called input layer, hidden layer (or layers) and output layer. ANNs which only have single layer only contains the input and output layer.

* **Input Layer**: Receives data from the outside world and sends it to first hidden layer.
* **Hidden Layers**: Computes the data with algorithms sends the output data to the output layer if the computation is finished. The more computation is needed, the output data is sent to the next hidden layer.
* **Output Layer**: Produces output data received from the last hidden layer to the outside world.[[2]](#footnote-1) [Lecture 7]

What are Artificial Neural Networks?  
Artificial neural network (ANN) is algorithms that find relationships in a dataset similar to how humans think. ANN are based on the same principle as a human brain, as people learn through their surroundings and then save the information. In order for an artificial neural network to find relationships, it must first be trained. They learn by training them with examples where the correct result is known.[[3]](#footnote-2)

What is ANN limited by?  
ANN are limited by the hardware it uses and the time takes to train it. If the ANN needs to compute more complex tasks, it requires a considerable amount of compute power and the longer time to produce good results.

Explain the three common layers in artificial neural network.  
 A typical ANN consists of differents layers called input layer, hidden layer (or layers) and output layer.

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In which application can ANN be used?  
They can be trained to interpret handwritten text or to recognize faces. ANN is also good at other areas, for example stock market prediction and image compression. [Lecture 7]

When was the first computational model for neural networks created?  
The first computational model was proposed by McCulloch and Pitts in 1943. [Lecture 7]

What is NEAT?  
NEAT, or Neuro-Evolution of Augmenting Topologies, is a method for evolving artificial neural networks with a genetic algorithm, introduced by Kenneth O'Stanley and Risto Miikkulainen. The method is to start with a simple neural network and then allow it to become more complex with each new generation.[[5]](#footnote-4)

What is the difference between single layer and multilayer artificial neural networks?  
A Multilayer ANN contains one or more hidden layers between the input and output layer while singler layer does not contain any hidden layer. Single layer only contains an input and output layer.[[6]](#footnote-5)

Mentions some activation functions in ANN.  
There are unit step (threshold) , sigmoid, piecewise linear, gaussian and linear.[[7]](#footnote-6)

What is Back-propagation?[[8]](#footnote-7)  
Back Propagation is is an algorithm to train a neural networks to minimize errors for a given input and output using gradient descent. Given a neural network and an error function, the gradient is calculated for the error function using the network’s weights.

What is a feedforward neural network?[[9]](#footnote-8)  
In a feedforward neural network, connections between nodes do not form cycles. They were the first type of neural networks invented and are a simpler version of their counterpart, recurrent neural networks. They are called feedforward because information only travels forward (since there are no loops), starting at the input nodes, travelling through hidden nodes and finally through the output nodes. Feedforward networks are used for supervised learning where the data is neither sequential or time-dependant, for example, when calculating an output for f(x) ~ y for pairs (x, y), while a recurrent network may do so for sequential data for pairs f(xi) ~ yi for all pairs (xi, yi).

1. <http://www.psych.utoronto.ca/users/reingold/courses/ai/cache/neural2.html> [↑](#footnote-ref-0)
2. <https://ujjwalkarn.me/2016/08/09/quick-intro-neural-networks/> [↑](#footnote-ref-1)
3. <http://www.psych.utoronto.ca/users/reingold/courses/ai/cache/neural2.html> [↑](#footnote-ref-2)
4. <https://ujjwalkarn.me/2016/08/09/quick-intro-neural-networks/> [↑](#footnote-ref-3)
5. <http://nn.cs.utexas.edu/downloads/papers/stanley.ec02.pdf> [↑](#footnote-ref-4)
6. <http://engineeronadisk.com/V2/hugh_jack_masters/engineeronadisk-10.html> [↑](#footnote-ref-5)
7. <http://www.saedsayad.com/artificial_neural_network.htm> [↑](#footnote-ref-6)
8. [https://brilliant.org/wiki/backpropagation/](https://brilliant.org/wiki/backpropagation/#the-backpropagation-algorithm) [↑](#footnote-ref-7)
9. <https://brilliant.org/wiki/feedforward-neural-networks/> [↑](#footnote-ref-8)